

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BOARD OF PATENT APPEALS AND INTERFERENCES

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In re Application of: Stefan HENNECK et al. :
Serial No.: 10/560,125 :
Filed: April 12, 2006 :
For: METHOD FOR PRODUCING CERAMIC :
GREEN COMPACTS FOR CERAMIC :
COMPONENTS :
Examiner: Vu Anh Nguyen :
Art Unit: 1796 :
Confirmation No. 2741 :
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Signature: /Kevin Kambo/
Kevin Kambo

APPEAL BRIEF PURSUANT TO 37 C.F.R. § 41.37

SIR:

On August 21, 2009, Appellants filed a Notice of Appeal from the last decision of the Examiner contained in the Final Office Action dated May 21, 2009 in the above-identified patent application.

In accordance with 37 C.F.R. § 41.37, this brief is submitted in support of the appeal of the rejections of claims 17 to 36. For at least the reasons set forth below, the rejections of claims 17 to 36 should be reversed.

1. REAL PARTY IN INTEREST

The real party in interest in the present appeal is ROBERT BOSCH GMBH of Stuttgart in the Federal Republic of Germany, which is the assignee of the entire right, title and interest in and to the present application.

2. RELATED APPEALS AND INTERFERENCES

There are no other prior or pending appeals, interferences or judicial proceedings known by the undersigned, or believed by the undersigned to be known to Appellants or the assignee, ROBERT BOSCH GMBH, “which may be related to, directly affect or be directly affected by or have a bearing on the Board’s decision in the pending appeal.”

3. STATUS OF CLAIMS

Claims 17 to 36 are pending.

Claims 1 to 16 have been canceled.

Claims 28 to 31 stand rejected under 35 U.S.C. § 112, second paragraph as indefinite.

Claims 17, 19 to 22, and 28 to 32 stand rejected under 35 U.S.C. § 103(a) as unpatentable over the combination of U.S. Patent No. 5,057,360 (“Osaka et al.”) and WO 2001/044142 (“Scheying et al.”), or U.S. Patent Application Publication No. 2003/0098529 (“Drumm et al.”), or U.S. Patent No. 6,533,966 (“Nonninger et al.”).

Claims 23, 33, and 34 stand rejected under 35 U.S.C. § 103(a) as unpatentable over the combination of Osaka et al. and Scheying et al., or Drumm et al., or Nonninger et al., and WO 95/30503 (“McAlea et al.”).

Claims 18, 27, 35, and 36 stand rejected under 35 U.S.C. § 103(a) as unpatentable over the combination of Osaka et al. and Scheying et al., or Drumm et al., or Nonninger et al., and Journal of Materials Science 37 (2002), 926-934 (“Reddy et al.”).

Claims 24 to 26 stand rejected under 35 U.S.C. § 103(a) as unpatentable over the combination of Osaka et al. and Scheying et al., or Drumm et al., or Nonninger et al., and <http://pubs.acs.org/cen/topstory/8005/8005notw5.html> (“C&EN”) and http://www2.mst.dk/common/Udgivramme/Frame.asp?http://www2.mst.dk/udgiv/publication/s/2001/87-7944-407-5/html/kap03_eng.htm (“DEPA”).

A copy of the appealed claims, *i.e.*, claims 17 to 36, is attached hereto in the Claims Appendix.

4. STATUS OF AMENDMENTS

In response to the Final Office Action dated May 21, 2009, Appellants filed a “Reply Under 37 C.F.R. § 1.116” (“the Reply”) on July 21, 2009, in which claims 28 to 31 were amended. The Advisory Action dated July 28, 2009 states that the proposed amendments would be entered for the purposes of appeal. It is therefore Appellants’ understanding that the claims as included in the annexed “Claims Appendix” reflect the current claims.

5. SUMMARY OF THE CLAIMED SUBJECT MATTER

The appealed claims contain two (2) independent claims, *i.e.*, claims 17 and 36.

Independent claim 17 relates to a method for preparing ceramic green compacts for ceramic components. *Specification* at page 4, lines 13 to 15 and page 5, lines 22 to 26. Claim 17 recites that the method includes preparing a dispersing agent solution by homogenizing one or more dispersing agents in combination with an organic acid in a solvent mixture to provide a dispersing agent solution. *Specification* at page 5, lines 27 to 29 and page 6, lines 7 to 12. Claim 17 recites that the method includes preparing a binder solution by homogenizing the solvent mixture from step a), at least one acrylatemethacrylate copolymers as the binder and at least one softener. *Specification* at page 7, lines 4 to 6 and 11 to 15. Claim 17 recites that the method includes preparing a first dispersion by homogenizing a ceramic powder and the dispersing agent solution, and subsequent deagglomeration. *Specification* at page 7, lines 27 to 30 and page 8, lines 1 to 2. Claim 17 recites that the method includes preparing a second dispersion by homogenizing the first dispersion and the binder solution. *Specification* at page 8, lines 5 to 9. Claim 17 recites that the method includes removing air and highly volatile solvent components from the second dispersion. *Specification* at page 8, lines 13 to 15.

Independent claim 36 relates to a piezo-multilayer actor. *Specification* at page 4, lines 13 to 16 and page 8, lines 29 to 30. Claim 36 recites that the piezo-multilayer actor includes ceramic green compacts. *Specification* at page 4, lines 13 to 15. Claim 36 further recites that the ceramic green compacts are formed by preparing dispersing agent solution by homogenizing one or more dispersing agents in combination with an organic acid in a solvent mixture to provide a dispersing agent solution. *Specification* at page 5, lines 27 to 29 and page 6, lines 7 to 12. Claim 36 recites that the method includes preparing a binder solution

by homogenizing the solvent mixture from step a), at least one acrylatemethacrylate copolymers as the binder and at least one softener. *Specification* at page 7, lines 4 to 6 and 11 to 15. Claim 36 recites that the method includes preparing a first dispersion by homogenizing a ceramic powder and the dispersing agent solution, and subsequent deagglomeration. *Specification* at page 7, lines 27 to 30 and page 8, lines 1 to 2. Claim 36 recites that the method includes preparing a second dispersion by homogenizing the first dispersion and the binder solution. *Specification* at page 8, lines 5 to 9. Claim 36 recites that the method includes removing air and highly volatile solvent components from the second dispersion. *Specification* at page 8, lines 13 to 15.

6. GROUND OF REJECTION TO BE REVIEWED ON APPEAL

- A. Whether claims 28 to 31 are definite under 35 U.S.C. § 112, second paragraph.
- B. Whether claims 17, 19 to 22, and 28 to 32 are patentable under 35 U.S.C. § 103(a) over the combination of Osaka et al. and Scheying et al., or Drumm et al., or Nonninger et al.
- C. Whether claims 23, 33, and 34 are patentable under 35 U.S.C. § 103(a) over the combination of Osaka et al. and Scheying et al., or Drumm et al., or Nonninger et al., and McAlea et al.
- D. Whether claims 18, 27, 35, and 36 are patentable under 35 U.S.C. § 103(a) over the combination of Osaka et al. and Scheying et al., or Drumm et al., or Nonninger et al., and Reddy et al.
- E. Whether claims 24 to 26 are patentable under 35 U.S.C. § 103(a) over the combination of Osaka et al. and Scheying et al., or Drumm et al., or Nonninger et al., C&EN, and DEPA.

7. ARGUMENTS

A. Rejection of Claims 28 to 31 Under 35 U.S.C. § 112, Second Paragraph

Claims 28 to 31 stand rejected under 35 U.S.C. § 112, second paragraph as allegedly indefinite. It is respectfully submitted that the present rejection should be reversed for at least the following reasons.

The Final Office Action contends that “[s]ince the concentration of the binder solution is not defined, these ratios are ambiguous.” However, a person of ordinary skill in the art would, reading the specification, recognize what concentrations of the binder solution is necessary given the ratios set forth in the claims. The definiteness requirement of 35

U.S.C. § 112, second paragraph is satisfied if the “the claims set out and circumscribe a particular subject matter with a *reasonable degree of clarity and particularity*.” M.P.E.P. § 2173.02 (emphasis added). Further, definiteness of claim language must be analyzed, not in a vacuum, but in light of, for example, (a) the content of the particular application disclosure; (b) the teachings of the prior art; and (c) the claim interpretation that would be given by one possessing the ordinary level of skill in the pertinent art at the time the invention was made. *Id.*

In view of these proper considerations, it is respectfully submitted that one of ordinary skill in the art would recognize what concentrations the binder solution should be in accordance with the ratios set forth in the claims. Thus, it is respectfully submitted that the present claims sufficiently set out and circumscribe a particular subject matter with a reasonable degree of clarity and precision, which, as indicated above, is all that is required for compliance with the definiteness requirement of 35 U.S.C. § 112.

In view of all of the foregoing, reversal of this rejection is respectfully requested.

B. Rejection of Claims 17, 19 to 22, and 28 to 32 Under 35 U.S.C. § 103(a)

Claims 17, 19 to 22, and 28 to 32 stand rejected under 35 U.S.C. § 103(a) as unpatentable over the combination of Osaka et al. and Scheying et al., or Drumm et al., or Nonninger et al. It is respectfully submitted that the combination of Osaka et al. and Scheying et al., or Drumm et al., or Nonninger et al. does not render unpatentable these claims for at least the following reasons.

Claim 17 relates to a method for preparing ceramic green compacts for ceramic components, including, *inter alia*, the features of preparing a second dispersion by homogenizing the first dispersion and the binder solution. According to the present claim, after *a first dispersion is prepared by homogenizing a ceramic powder* and a dispersing agent solution...*a second dispersion is prepared by homogenizing the first dispersion and a binder solution.*

As explained in greater detail below, Appellants respectfully submit that the Examiner’s assertions in the Advisory Action dated July 28, 2009 mischaracterizes Appellants’ position, *i.e.*, the Examiner understands Appellants to maintain that the *binder solution* contains *ceramic powder*. Rather, Appellants maintain that it is the *second dispersion* that contains the *ceramic powder*, not the *binder solution*.

Claim 17 recites the feature of “preparing a first dispersion by homogenizing a ceramic powder and the dispersing agent solution.” Accordingly, the first dispersion contains, among other things, a ceramic powder. The next step in claim 17 recites “preparing a second dispersion by homogenizing the first dispersion and the binder solution.” Accordingly, the second dispersion contains, among other things, the first dispersion and hence a ceramic powder.

Therefore, the Examiner’s contention in the Advisory Action dated July 28, 2009, that “the prior art method reads on the claimed method with the only exception being that the prior art method lacks an organic acid, which is readily remedied by the cited secondary references,” is plainly untenable. Nowhere, does Osaka et al., Scheying et al., Drumm et al., or Nonninger et al. disclose, or even suggest, *a second dispersion that contains a ceramic powder*. Osaka et al. relates to a method for preparing a ceramic green sheet including ball milling a mixture of ceramic powder, solvent, and dispersant, and adding a binder and plasticizer to the mixture. Osaka et al. merely indicates homogeneously mixing a ceramic powder (zirconia or alumina) with a binder. Nowhere does Osaka et al. disclose, or even suggest, preparing a second dispersion by homogenizing the first dispersion with a binder solution, where the first dispersion contains at least ceramic powder. Scheying et al., Drumm et al., and Nonninger et al. do not cure this deficiency.

In view of the foregoing, it is respectfully submitted that the combination of Osaka et al. and Scheying et al., or Drumm et al., or Nonninger et al. fails to render unpatentable claim 17.

As for claims 19 to 22, and 28 to 32, which ultimately depend from claim 17 and therefore include all of the features included in claim 17, it is respectfully submitted that the combination of Osaka et al. and Scheying et al., or Drumm et al., or Nonninger et al. fails to render unpatentable these dependent claims for at least the reasons more fully set forth above in support of the patentability of claim 17.

In view of all of the foregoing, reversal of this rejection is respectfully requested.

C. Rejection of Claims 23, 33, and 34 Under 35 U.S.C. § 103(a)

Claims 23, 33, and 34 stand rejected under 35 U.S.C. § 103(a) as unpatentable over the combination of Osaka et al. and Scheying et al., or Drumm et al., or Nonninger et al., and McAlea et al. It is respectfully submitted that the combination of Osaka et al. and

Scheying et al., or Drumm et al., or Nonninger et al., and McAlea et al. does not render unpatentable these claims for at least the following reasons.

Claims 23, 33, and 34 depend from claim 17 and therefore include all of the features recited in claim 17. As indicated above, the combination of Osaka et al. and Scheying et al. or Drumm et al. or Nonninger et al. does not disclose or even suggest all of the features recited in claim 17. McAlea et al. is not relied upon as disclosing the features of claim 17 not disclosed or suggested by the combination of Osaka et al. and Scheying et al. or Drumm et al. or Nonninger et al. Indeed, McAlea et al. do not disclose, or even suggest, the features of claim 17 not disclosed or suggested by the combination of Osaka et al. and Scheying et al. or Drumm et al. or Nonninger et al.

As such, it is respectfully submitted that the combination of Osaka et al. and Scheying et al. or Drumm et al. or Nonninger et al., and McAlea et al. does not render unpatentable claims 23, 33, and 34.

In view of all of the foregoing, reversal of this rejection is respectfully requested.

D. Rejection of Claims 18, 27, 35, and 36 Under 35 U.S.C. § 103(a)

Claims 18, 27, 35, and 36 stand rejected under 35 U.S.C. § 103(a) as unpatentable over the combination of Osaka et al. and Scheying et al., or Drumm et al., or Nonninger et al., and Reddy et al. It is respectfully submitted that the combination of Osaka et al. and Scheying et al., or Drumm et al., or Nonninger et al., and Reddy et al. does not render unpatentable these claims for at least the following reasons.

Claims 18, 27, and 35 depend from claim 17 and therefore include all of the features recited in claim 17. As indicated above, the combination of Osaka et al. and Scheying et al., or Drumm et al., or Nonninger et al. does not disclose or even suggest all of the features recited in claim 17. Reddy et al. is not relied upon as disclosing the features of claim 17 not disclosed or suggested by the combination of Osaka et al. and Scheying et al., or Drumm et al., or Nonninger et al. Indeed, Reddy et al. does not disclose, or even suggest, the features of claim 17 not disclosed or suggested by the combination of Osaka et al. and Scheying et al., or Drumm et al., or Nonninger et al.

As such, it is respectfully submitted that the combination of Osaka et al. and Scheying et al., or Drumm et al., or Nonninger et al., and Reddy et al. does not render unpatentable claims 18, 27, and 35.

Claim 36 relates to a piezo-multilayer actor which includes ceramic green compacts that are formed by performing methods that are analogous to the methods of claim 17, including, preparing a second dispersion by homogenizing the first dispersion and the binder solution. As such, it is respectfully submitted that the combination of Osaka et al. and Scheying et al., or Drumm et al., or Nonninger et al., and Reddy et al. does not render unpatentable claim 36 for at least the same reasons set forth above in support of the patentability of claim 17.

In view of all of the foregoing, reversal of this rejection is respectfully requested.

E. Rejection of Claims 24 to 26 Under 35 U.S.C. § 103(a)

Claims 24 to 26 stand rejected under 35 U.S.C. § 103(a) as unpatentable over the combination of Osaka et al. and Scheying et al., or Drumm et al., or Nonninger et al., and C&EN, and DEPA. It is respectfully submitted that the combination of Osaka et al. and Scheying et al., or Drumm et al., or Nonninger et al., and C&EN and DEPA does not render unpatentable these claims for at least the following reasons.

Claims 24 to 26 depend from claim 17 and therefore include all of the features recited in claim 17. As indicated above, the combination of Osaka et al. and Scheying et al., or Drumm et al., or Nonninger et al. does not disclose or even suggest all of the features recited in claim 17. C&EN and DEPA are not relied upon as disclosing the features of claim 17 not disclosed or suggested by the combination of Osaka et al. and Scheying et al., or Drumm et al., or Nonninger et al. Indeed, C&EN and DEPA do not disclose, or even suggest, the features of claim 17 not disclosed or suggested by the combination of Osaka et al. and Scheying et al., or Drumm et al., or Nonninger et al.

As such, it is respectfully submitted that the combination of Osaka et al. and Scheying et al., or Drumm et al., or Nonninger et al., and C&EN and DEPA does not render unpatentable claims 24 to 26.

In view of all of the foregoing, reversal of this rejection is respectfully requested.

8. CLAIMS APPENDIX

A “Claims Appendix” is attached hereto and appears on the three (3) pages numbered “Claims Appendix 1” to “Claims Appendix 3.”

9. EVIDENCE APPENDIX

No evidence has been submitted pursuant to 37 C.F.R. §§ 1.130, 1.131 or 1.132. No other evidence has been entered by the Examiner or relied upon by Appellants in the appeal. An “Evidence Appendix” is nevertheless attached hereto and appears on the one (1) page numbered “Evidence Appendix.”

10. RELATED PROCEEDINGS APPENDIX

As indicated above in Section 2, “[t]here are no other prior or pending appeals, interferences or judicial proceedings known by the undersigned, or believed by the undersigned to be known to Appellants or the assignee, ROBERT BOSCH GMBH, ‘which may be related to, directly affect or be directly affected by or have a bearing on the Board’s decision in the pending appeal.’” As such, there are no “decisions rendered by a court or the Board in any proceeding identified pursuant to [37 C.F.R. § 41.37(c)(1)(ii)]” to be submitted. A “Related Proceedings Appendix” is nevertheless attached hereto and appears on the one (1) page numbered “Related Proceedings Appendix.”

11. CONCLUSION

For at least the reasons indicated above, Appellants respectfully submit that the art of record does not disclose or suggest the subject matter as recited in the claims of the above-identified application. Accordingly, it is respectfully submitted that the subject matter as set forth in the claims of the present application is patentable.

In view of all of the foregoing, reversal of the rejections set forth in the Final Office Action is therefore respectfully requested.

Respectfully submitted,

/Clifford A. Ulrich/

Dated: November 6, 2009

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CLAIMS APPENDIX

17. A method for preparing ceramic green compacts for ceramic components, the method comprising:

- a) preparing a dispersing agent solution by homogenizing one or more dispersing agents in combination with an organic acid in a solvent mixture to provide a dispersing agent solution;
- b) preparing a binder solution by homogenizing the solvent mixture from step a), at least one acrylatemethacrylate copolymers as the binder and at least one softener;
- c) preparing a first dispersion by homogenizing a ceramic powder and the dispersing agent solution, and subsequent deagglomeration;
- d) preparing a second dispersion by homogenizing the first dispersion and the binder solution; and
- e) removing air and highly volatile solvent components from the second dispersion.

18. The method of claim 17, wherein polymeric dispersing agents having acid groups are used as the dispersing agents.

19. The method of claim 17, wherein oxa acids are used as the organic acid.

20. The method of claim 19, wherein the oxa acids are selected from the group consisting of 3,6-dioxaheptanoic acid, 3,6,9-trioxadecanoic acid, 3,6,9-trioxaundecanedioic acid and polyglycol diacid.

21. The method of claim 17, wherein the solvent mixture is selected from the group consisting of alcohols, esters and ketones, the solvent mixture containing at least one alcohol.

22. The method of claim 21, wherein the solvent mixture is selected from the group consisting of ethanol, isopropanol, n-propanol, n-butanol, ethyl acetate, butyl acetate, 1-methoxy-2-propyl acetate and methylethyl ketone.

23. The method of claim 17, wherein a thermal decomposition of a binder polymer occurs by depolymerization.

24. The method of claim 17, wherein the softener that is used is an ester-based, phthalate-free softener.

25. The method of claim 24, wherein the softener is an ester of citric acid or adipic acid.

26. The method of claim 24, wherein the softener is selected from the group consisting of tributyl citrate, triethyl citrate, acetyltributyl citrate, bis-2l-ethylhexyl adipate and isononyl adipate.

27. The method of claim 17, wherein a ceramic powder that is used includes a PZT powder.

28. The method of claim 26, wherein the ceramic powder and the dispersing agent solution are homogenized at a proportion between 70:30 to 90:10.

29. The method of claim 26, wherein the ceramic powder and the dispersing agent solution are homogenized at a proportion between 70:30 to 85:15.

30. The method of claim 17, wherein the first dispersion and the binder solution are homogenized at a proportion between 70:30 to 90:10.

31. The method of claim 17, wherein the first dispersion and the binder solution are homogenized at a proportion between 70:30 to 80:20.

32. The method of claim 17, wherein the removing of air and the highly volatile solvent components from the second dispersion takes place simultaneously, with the aid of a vacuum pump.

33. The method of claim 17, wherein a proportion of the binder to the softener is in a range of 55:45 and 75:25.

34. The method of claim 17, wherein a proportion of the binder to the softener is in a range of 55:45 and 67:33.

35. The method of claim 17, wherein the ceramic components are multilayer assemblies.

36. A piezo-multilayer actor comprising:
ceramic green compacts, the ceramic green compacts being formed by performing the following:

a) preparing a dispersing agent solution by homogenizing one or more dispersing agents in combination with an organic acid in a solvent mixture to provide a dispersing agent solution;

b) preparing a binder solution by homogenizing the solvent mixture from step a), at least one acrylatemethacrylate copolymers as the binder and at least one softener;

c) preparing a first dispersion by homogenizing a ceramic powder and the dispersing agent solution, and subsequent deagglomeration;

d) preparing a second dispersion by homogenizing the first dispersion and the binder solution; and

e) removing air and highly volatile solvent components from the second dispersion

EVIDENCE APPENDIX

No evidence has been submitted pursuant to 37 C.F.R. §§1.130, 1.131, or 1.132. No other evidence has been entered by the Examiner or relied upon by Appellants in the appeal.

RELATED PROCEEDINGS APPENDIX

As indicated above in Section 2 of this Appeal Brief, “[t]here are no other prior or pending appeals, interferences or judicial proceedings known by the undersigned, or believed by the undersigned to be known to Appellants or the assignee, ROBERT BOSCH GMBH, ‘which may be related to, directly affect or be directly affected by or have a bearing on the Board’s decision in the pending appeal.’” As such, there are no “decisions rendered by a court or the Board in any proceeding identified pursuant to [37 C.F.R. § 41.37(c)(1)(ii)]” to be submitted.